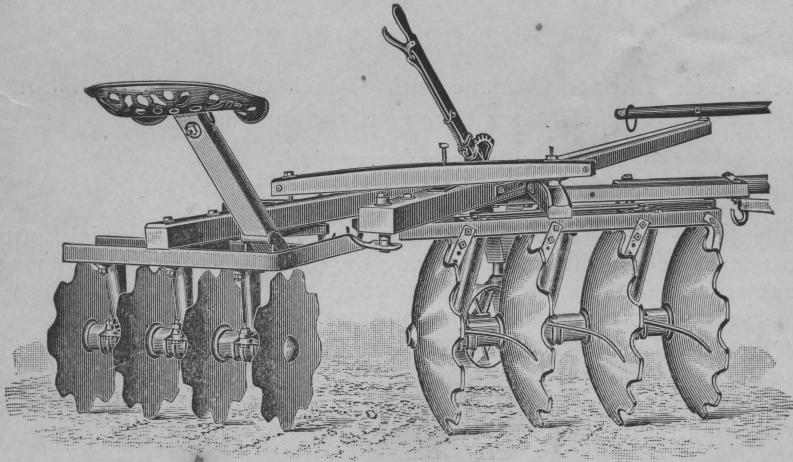


A. R. Bullis,

CULTURE

—OF—

SUGAR BEETS.



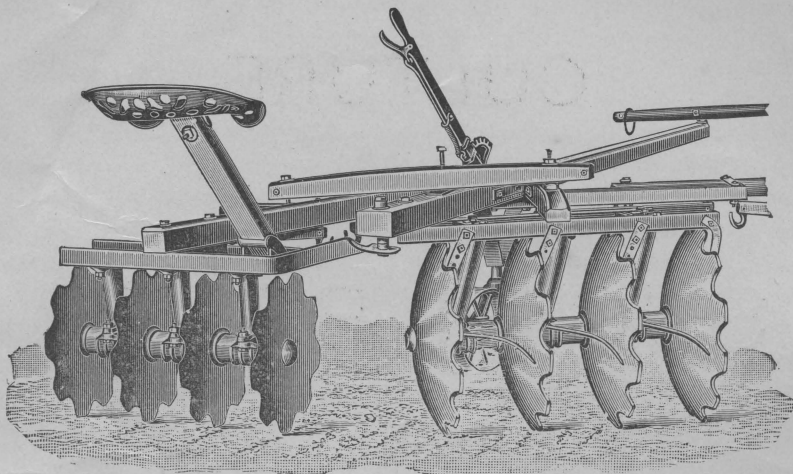
A Few Words How to Best Grow the Sugar Beet.

PUBLISHED BY

THE CUTAWAY HARROW CO.

Press of Middlesex County Printery, Portland, Conn.

THE 40 INCH TORNADO CUTAWAY.



The 24-inch Tornado is made with 22-inch turning disks ; all other sizes carry a 24-inch turning disk.

YOU WANT THEM.

We desire to call your attention to two new machines which, after most through use in the field during the past season, we put on the market with the confidence that where thoroughly used they will supersede all other tools for this purpose.

The TORNADO CUTAWAY is practically a Rotary Plow, designed especially for grain stubble, corn land, and all fallow plowing. With the Tornado you can put the ground in the most complete condition for seeding, doing away entirely with the plow and harrow.

The peculiar shape of the turning disks enables them to turn under and cover stubble and trash of all kinds, at the same time thoroughly aerating and lightening up the soil and leaving it in the the most friable condition, thus enabling the crop to get a quick start and early growth. There has never yet been a tool put into the ground that will do the work of the Tornado Cutaway.

The machine is made with Steel Frame, being provided with a gauge wheel to regulate the depth to be plowed. Also, each disk carries a Clod Breaker and a Weed Tucker for putting under all trash and stubble.

The Tornado Cutaway is made in six sizes, as follows:

- 24-inch 2-horse machine cuts a furrow 24 inches wide and 5 to 7 inches deep.
- 30-inch Heavy 2-horse machine cuts a furrow 30 inches wide and 5 to 7 inches deep.
- 40-inch Light 4-horse machine cuts a furrow 40 inches wide and 5 to 7 inches deep.
- 50-inch Heavy 4-horse machine cuts a furrow 50 inches wide and 5 to 7 inches deep.
- 60-inch 4 to 6-horse machine cuts a furrow 60 inches wide and 5 to 7 inches deep.
- 70-inch 6 to 8-horse machine cuts a furrow 70 inches wide and 5 to 7 inches deep.

CULTURE OF SUGAR BEETS.

The growing of Sugar Beets is attracting attention in all parts of our country. New Sugar Plants are being put in a great many sections for the manufacture of sugar from the sugar beet which are meeting with great success and bringing the farmers more ready cash than any other crop. From careful investigation we are satisfied that there is scarcely a State but what will grow sugar beets to success.

A large sugar beet factory at Pecos, New Mexico, has developed that the percent of sugar in beets runs very high in that section. California has several factories and is well adapted, the percent of sugar running almost equal to Germany. Nebraska, also Utah, is steadily developing a large beet growing industry and Sugar Plants are meeting with great success.

We find upon investigation the best sugar-beet-soils are in Colorado, California, Indiana, Illinois, Iowa, Kentucky, Minnesota, Michigan, Nebraska, New York, New Mexico, North Dakota, Wisconsin, Ohio, South Dakota, Utah, Virginia, Washington, Oregon and Wyoming.

If there is no sugar beet factory in your section it will pay the farmers to interest themselves to the extent of arranging for the location of a plant.

The average consumption of sugar in 1890 and 1891 in the United States was $59\frac{1}{2}$ pounds per head, so with a population of 63,000,000 you can easily figure up the wants. The United States is paying out over one million in gold a year for sugar of which all ought and can be raised in this country.

Of course in the cooler climates beet silos should be arranged for keeping same. The season for planting in the mild climate is much longer; for instance, in Southern California the planting cannot commence until February and continue until June, thus giving a beet crop continuously coming to maturity from 1st of August to the 1st of December. In mild northern localities the planting must be accomplished in a short time, say from the tenth of May until the first of June. Previous to this time the ground is almost too cold for planting. Of course a great deal depends upon the advance of the season.

The sugar beet requires a certain amount of moisture in order to produce its normal crop. The moisture must be derived either by precipitation, in the usual way, or else the soil must be of that particular quality which will allow subterranean moisture to reach the rootlets of the plants. The porous, sandy soils surrounding our Western rivers, especially the Platt River in Nebraska and the Arkansas River in

Kansas, seem to furnish sufficient moisture to produce a good crop in connection with the rainfall, of which little is expected in those localities during the summer months. Also they are producing great crops in New Mexico largely from irrigation. While the beet thrives well with very little rainfall if properly cultivated, yet moisture is to its advantage.

There are a great many varieties of white sugar beet. We mention only the best varieties. Growers should be particular in obtaining seed and know that it is pure and up to standard.

Among the more frequently occurring varieties grown in Europe may be mentioned the Vilmorin Improved, Klein Wanzlebener, Improved Klein Wanzlebener, White Excelsior, White Imperial, Simon Le Grande, Florimond and Bulteau Desprez Richest, Brabant Sugar Beet, Rose Imperial, etc.

The two varieties which have been most widely grown in this country are the Vilmorin Improved and the Klein Wanzlebener. The certainty that the seed has been grown according to the most scientific methods is of greater importance to the beet grower than the variety. The beet has reached such a high state of perfection as to make the least degree of laxity in its treatment exceedingly dangerous to its qualities.

The sugar beet does not require a particular kind of soil for its proper production. In general, soils are described for practical purposes as clayey, sandy, loamy, or alluvial soils; all of these soils will produce beets. The black prairie soils also have been found, with proper cultivation, to produce excellent beets. Generally, the least favorable soils for the sugar beet are a stiff clay, which is cultivated with difficulty and readily packs under the influence of hard rains and hot suns, and virgin soils or those especially rich in organic matter or alkaline salts. Perhaps the best soil may be described as a sandy loam; a soil containing a happy equilibrium between organic matters, clay and silica.

In general it may be said that any soil that will produce a good crop of Indian corn, wheat, or potatoes will, under proper cultivation, produce a good crop of sugar beets. The soil on which sugar beets are grown, however, should be reasonably level, and this being the case it should be well drained. Natural drainage on level soil being somewhat deficient, it is most imperative that the tile drainage be practiced. It would be useless to attempt to raise sugar beets on level land without tile drainage, especially in a rainy season.

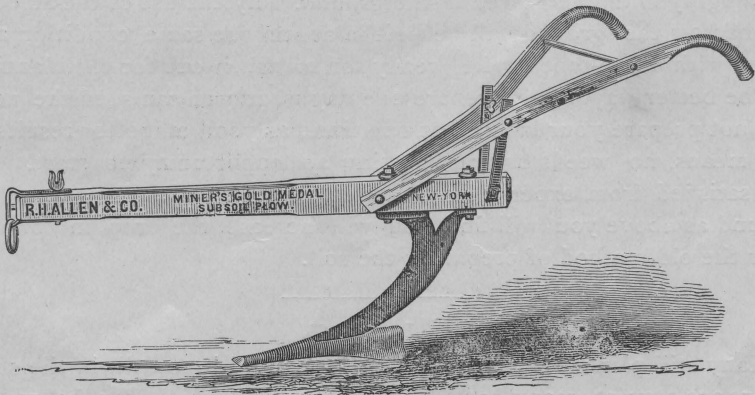
Most of our soils at first will require but very little fertilizer. The commercial fertilizers are the best, and those containing nitrogen, phosphoric acid, and potash. Nitrogenous manure should be applied with great care to sugar beet. It tends to produce a very heavy growth of the beet to the detriment of its sugar producing qualities. Potash and phosphoric acid can be applied with great freedom to beet fields; they work together much better than when applied separately.

Beets do best after wheat or some cereal. While it is true that they do well on the same field for several years, nevertheless, a proper rotation is always desirable.

A good scheme of rotation is, first wheat, then beets, then clover, one crop of which is cut for hay and the second crop plowed under, then potatoes, wheat, and beets in the order mentioned. By this method and a judicious use of stall manure and commercial fertilizers, the fertility of the soil can be maintained and even increased. Beets should follow wheat or a cereal crop, because this crop being harvested early leaves the ground ready for autumn plowing, a prerequisite to successful beet culture.

Preparation of the Land for Planting.

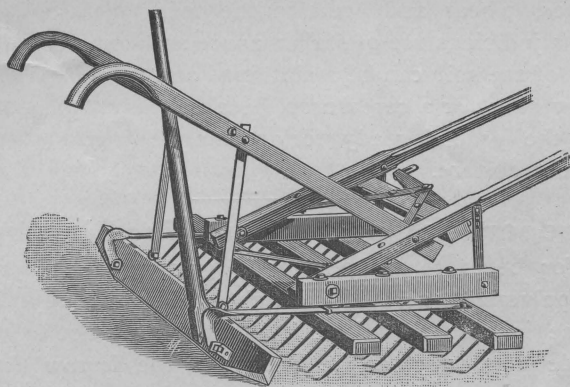
In order for beets to make a good growth the ground must be thoroughly pulverized, aerated and lightened up to a depth of at least seven to nine inches; therefore, it is important not to use the old style landside plow, which at the bottom of the furrow always packs the ground. Some recommend the use of the sub-soil, but after



most carefully working beet fields we find there is no tool that will put the ground in so fine and friable condition as the Tornado Cutaway.

This machine thoroughly pulverizes the land from the depth of five to eight inches, the bottom being as loose and friable as the top. Where the land is prepared with the Tornado the beet seed immediately germinate and the small roots get hold and the growth is much quicker and faster than from the old method of plowing and harrowing. If it is desired to mellow the ground deeper than nine inches we would recommend the use of the Miner Sub-soil plow, cut of which we [here-with show, after which we would recommend going over with the Tornado Cutaway.

The best results are obtained by preparing the land in the fall so when spring comes it will be quite mellow. After running over with the Tornado Cutaway, use the Cutaway Smoothing harrow for



thoroughly fining and leveling the ground. By the use of the Smoothing harrow the ground will be left in about the same condition as if raked with a fine-tooth rake, ready for marking out for the planting.

The better way is to prepare one day what you can seed the next, and not prepare your land all at one time, as you get better results by this means, no weeds or grass getting an opportunity to start. We are satisfied from experiments already made if you will prepare the ground as above you will find you will increase the crop in tonnage over the old method of preparing the soil.

Planting.

Many still plant by hand. The best method is to drill in the seed. There are a great many hand and horse drills which can be readily furnished upon application. In planting by drill it generally takes from 15 to 20 pounds of seed per acre; in planting by hand from 10 to

15 pounds per acre. In planting by drill it is much better to try your seed before starting your planter, as the seed varies in size from season to season. A dry season produces smaller seed and a wet season larger seed.

The seed should be covered in depth from $\frac{1}{2}$ to $1\frac{1}{2}$ inches, according to the condition of the soil. If the soil be moist and in excellent condition the seed should not be covered more than $\frac{1}{2}$ inch; if the soil is dry they should be covered at least $1\frac{1}{2}$ inches.

Cultivation.

As soon as the beets are large enough to mark the rows, cultivation with horse and hand hoe may be commenced. This is essential if the grass and weeds appear above the ground at this time. There are a great many small hand hoes and some horse hoes and cultivators which are well adapted for the cultivation, which can be furnished by any implement dealer.

As soon as the beets show four leaves thinning out should commence. If the rows be 18 inches apart you should see that strong, vigorous plants are left every 8 to 10 inches, destroying the weak, sickly plants and saving the strong, healthy ones.

Much of the thinning work can be done with a narrow-bladed hoe, but where the plants are close to the place where the preserved plant is to grow, work should be done by hand. Enough good hand hoeing produces good results.

Cultivation should in all cases be kept up for the double purpose of keeping the beets entirely free from weeds, and for preserving the proper tilth of the surface of the soil so they will draw the moisture from the ground. They should be cultivated at least once a week from six to eight weeks. In a very dry season we recommend more frequent cultivation as you will find the crop greatly benefitted by it. The final cultivation should leave the soil practically level. During cultivation care should be taken not to injure either the leaves or root of the beet, and when the foliage of the growing crop begins to cover well the surface of the soil cultivation should be suspended.

A great many different estimates have been made of the cost of growing, varying from \$33 to \$40 per acre. With these prices a net profit of from \$12 to \$15 per acre may be expected from localities near factory. Sugar beets will net at least five dollars per ton.

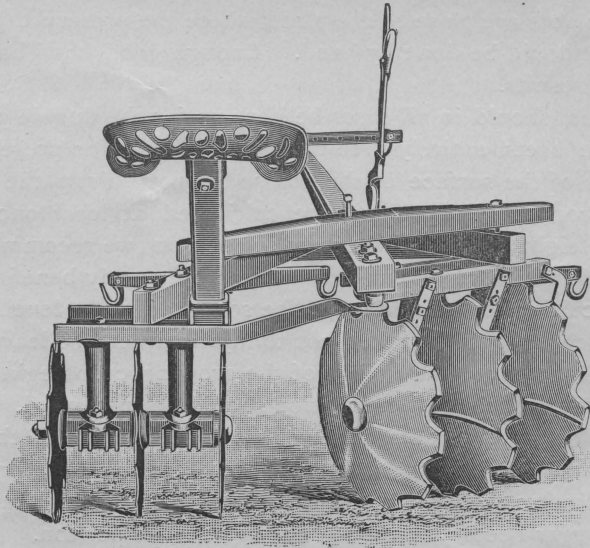
Harvesting.

The time for harvesting varies with different localities. In California beets planted in February are ready for harvest in August. It may generally be said, beets planted the first to the middle of May will be ready for harvest the middle of October. Harvesting should be postponed to as late a date as possible, provided there is no danger of a second growth. The leaves of the ripened beet change from a rich green to a yellowish green, become drooping and apply closely to the earth, many of them dying.

Many free their beets by running a small plow to the side, loosening the soil, then pull by hand. Although there are some machines made for harvesting the beet they are not generally used.

After they are pulled from the ground, remove the neck, which is done by a large knife and top of the beet, called technically its neck, and is cut off so as to remove, with the top, that portion of the beet to which the leaves of the beet have been attached. The tops left on the ground should be plowed in as fertilizer.

We have tried to give as near as we can obtain the best methods of raising* sugar beets. We also desire to call your attention to the line of Cutaway goods which are well adapted and we believe the best tools for growing beets of any that are made.



[The following article on the beet sugar industry was taken from the *New York Sun*, February 12, 1897. The article was so good we have taken the liberty to re-publish it here.

THE BEET SUGAR INDUSTRY.

A GREAT OPPORTUNITY OFFERED TO AMERICAN FARMERS.

\$30,000,000 Paid to Germany for Raw Material That Could Have Been Raised Here.

The sugar question is deservedly attracting much attention in this country. The consumption of sugar in the United States is about 60 pounds per capita. With the population of 70,000,000 this would make our total annual consumption fully 2,100,000 tons.

The production of sugar in this country does not exceed 400,000 tons, and of this only about 40,000 tons is beet sugar. We import from foreign countries about 1,700,000 tons, most of it being brown or raw sugar, which is purchased by the American Sugar Refining Company, and by other refiners, who refine and sell it, directly or indirectly to consumers. Most of this vast quantity of imported sugar comes from countries which either buy very little from us or discriminate against American products. In 1896 the Eastern refiners bought 500,000 tons of brown or raw German beet sugar, for which, including freight, about \$30,000,000 must have been paid. It is not yet definitely reported what our total foreign sugar bill was in 1896, but for the year ending June 30, 1894, it was \$120,000,000. Generally it takes nearly all our exports of breadstuffs to pay for our imported sugar. All our exports of provisions, including meat and dairy products, barely pay our sugar bill.

As we are now situated, our financial condition is constantly strained and put in peril because of the calls on us from foreign countries for gold. If we should make only one-half of the sugar we use, the relief, so far as our financial situation is concerned, would be equivalent to doubling our gold production.

It is probable that with only moderate protection the beet sugar industry will be rapidly developed, but with the best we can hope for it is doubtful if the production of sugar in the United States can catch

up with the consumption in twenty years. By that time our population will certainly be 100,000,000, and our consumption of sugar will be at least 3,600,000 tons annually, of which probably 3,000,000 tons will be beet sugar. Our yearly sugar bill will probably then amount to at least \$280,000,000. What would the production of 3,000,000 tons of beet sugar mean to our farmers? It would mean that they must produce annually about 33,000,000 tons of sugar beets, which would give them, at the lowest estimate, \$130,000,000. It would employ 3,300,000 acres of the best farming land, and not less than 500,000 men in the fields. It would also employ an army of men in the factories, in transportation, and in other employments. It would use 5,000,000 tons of coal, 2,000,000 tons of limestone, and call for a vast quantity of chemicals, machinery, etc. Why should we not do all this ourselves, instead of allowing it to be done by foreign countries which buy comparatively little from us, or which discriminate against our products?

It is doubtful if sugar beets can be successfully raised in many of the Southern States, where both the days and nights are hot, the atmosphere humid, and the autumn, or ripening season rainy. It is also doubtful if the extreme Northern States can successfully prosecute this industry. The seasons are too short, and severe winter comes too early. But we have a large area of country which is better adapted to the business than any part of Europe. More than one-half the weight of the sugar in the beet comes from the sunshine and not from the soil, and those countries which have a mild climate, combined with the greatest amount of sunlight, with a minimum of air moisture, are the ones which will produce sugar beets the richest in sugar and with the highest degree of purity. This accounts for the fact that California, Utah, and New Mexico have beaten the world's record in raising rich and pure sugar beets.

In France and Germany the percentage of sugar in the beets varies from 10 to 14 per cent., depending on the season. A fair average, taking one season with another, is about 12 to 13 per cent., from which 180 to 200 pounds a ton of marketable sugar are extracted.

The importance of having beets with a high percentage of saccharine matter, compared with those of a low percentage, in the successful prosecution of this industry cannot be overestimated. A factory able to work 100,000 tons of beets in a campaign of 130 days would cost, with sufficient working capital, about \$450,000. The difference in yield of sugar from 100,000 tons of beets running 14 per cent., and

from the same quantity running 17 per cent., would be 3,000 tons of sugar. The factory expense would be little more for working the latter than the former, but the increased gross income, with sugar at $3\frac{1}{2}$ cents a pound, would be \$210,000, which sum, under the method now ruling, would be nearly equally divided between the farmers and the factory. The question of purity cuts an almost equally important figure. It is well known that the higher the percentage of sugar the higher the purity; that means that the juice contains less of those elements which prevent crystallization, causing a loss of sugar. The average purity of beets raised in France and Germany is about 80, while that of those raised in New Mexico averages 84 per cent.

It is therefore, easy to see to what extent the successful prosecution of beet sugar business in any locality is an agricultural question. This will not be appreciated by many who embark in the business, and many failures will be inevitable. In Nebraska, for instance, they have cheaper fuel, labor and transportation than in California. Their product is 2,000 miles nearer market, and yet with all these apparent advantages, and with the aid of a State bounty, the financial results have been insignificant compared with those obtained by the factories situated where the soil is rich in the proper elements, water for irrigation abundant, almost constant sunshine, and a dry ripening and harvest-time. A week's rain after the beets are ripe deprives them of nearly half their sugar. In most parts of the arid region the falls and early winters are dry. Unquestionably, those parts of the arid region where irrigation is possible, which are not too far north, and which are not of too great elevation, are the ideal places for profitably carrying on the beet sugar business.

Many take it for granted that the interests of the sugar refiners and those of the beet sugar men will be deadly opposed to each other. Probably this may not be found, in actual experience, to be true.

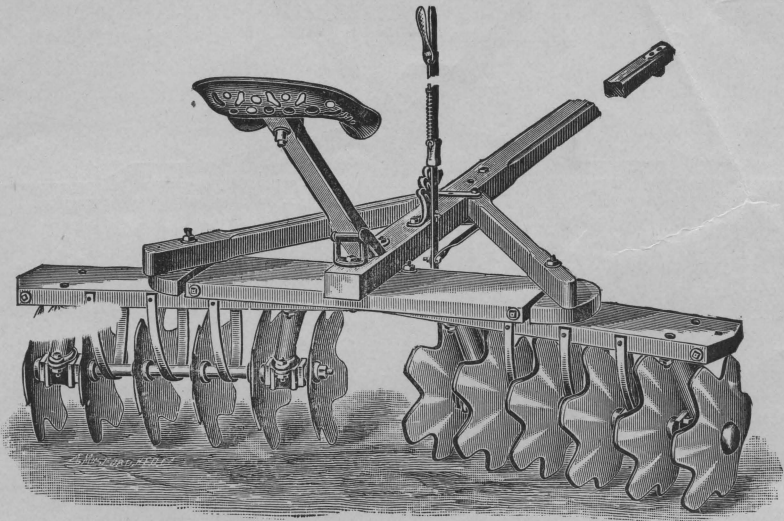
In France, Germany, and Austria a very large proportion of the beet sugar factories make brown, or raw, sugar which they sell to the large refineries at home or ship to foreign refiners. A large quantity goes to England and Scotland, and as before stated, over 500,000 tons were purchased by American refiners in 1896. Brown beet sugar of a certain polariscope test is quite as valuable as cane sugar of the same test. The mode of refining is precisely the same, and there is no difference in the resulting product.

White beet sugar produced by our American factories does not sell for quite as much as the white sugar produced by the great refineries.

It is sometimes a little off color, and the quality in the same factory may vary slightly from year to year, depending on the quality of the beets or the skill of those running the factory. In fact, the production of raw sugar and refining and distributing it to the public are two different trades. Sugar refineries are usually enormous concerns, employing large capital, high-priced men of great skill, and fitted with labor-saving and costly devices and processes which any beet sugar factory cannot afford. They receive raw sugar from many sources; it is mixed up and treated as a whole, just as the ores are in large smelters, and the result is a uniform product from month to month and year to year, which it is difficult to obtain by any single beet sugar factory. One moderate sized refinery in Philadelphia uses 125,000 tons of raw sugar annually. This is about thirteen times as much as the largest beet sugar factory in the United States can produce.

It seems clear, therefore, that building up the beet sugar industry in the United States will not end or outlaw the great sugar refining and distributing companies. If such a specific duty is put on raw sugar that it can be profitably produced here in large quantities cheaper than it can be imported, the skill, the capital, and the hold on the market controlled by the great refiners will be as necessary to the beet sugar men as the raw product they produce will be to the refiners. Rightly considered, their interests are or should be identical, and there should be no conflict between them in the making of a new tariff. They should be able to agree on two things—a specific duty on raw sugar, and a stiff duty against the refined sugar of bounty-paying countries. Think of our paying about \$30,000,000 yearly for German sugar when that Government does all in its power to exclude American farm products from its markets.

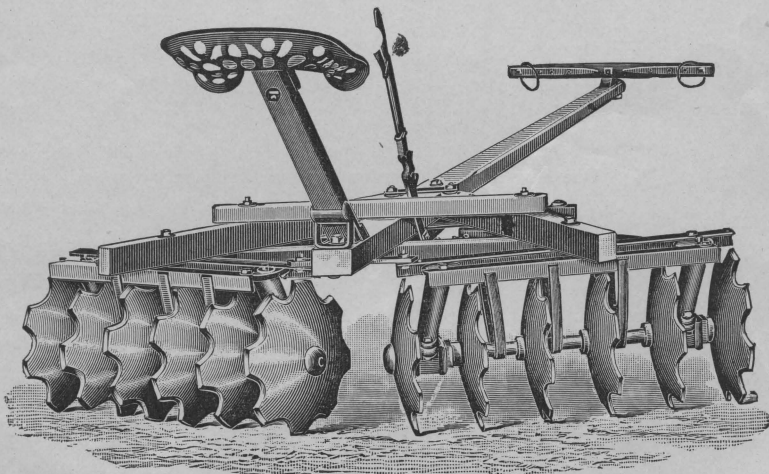
The A-6 Reversible or Fruit Growers' and Orchard Harrow.



HARROW SET FOR CULTIVATING AWAY FROM THE TREE.

The great demand for a good tool for cultivating orchards has led us to adapt the Cutaway Harrow to this use.

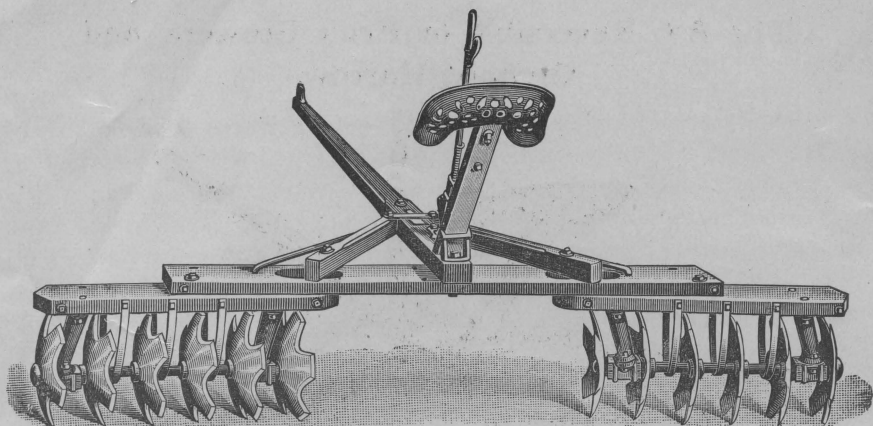
6-foot Reversible Harrow.



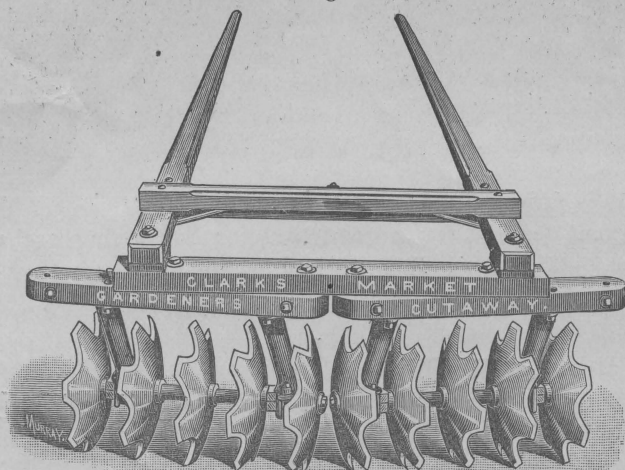
CULTIVATING TOWARD THE TREE.

No fruit grower can afford to be without this tool, and we can cheerfully refer any parties desiring this harrow to Messrs. G. H. & J. H. Hale, of South Glastonbury, Conn., who are among the largest and most successful peach growers in this country.

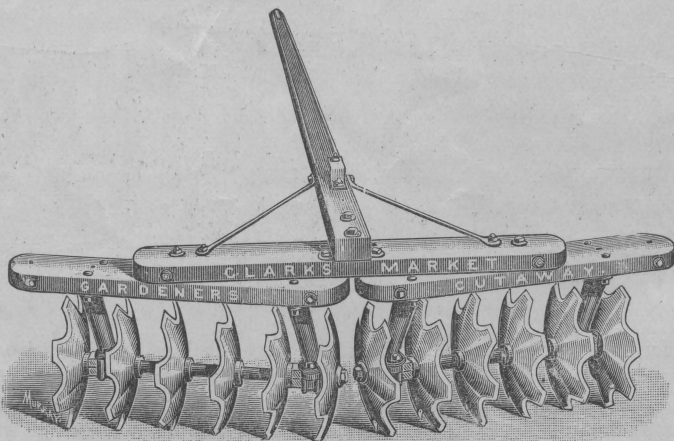
Reversible with Extension Head.



For Cultivating Orchards.



One Horse Market Garden or Grove Harrow.



Two Horse Market Garden or Grove Harrow.

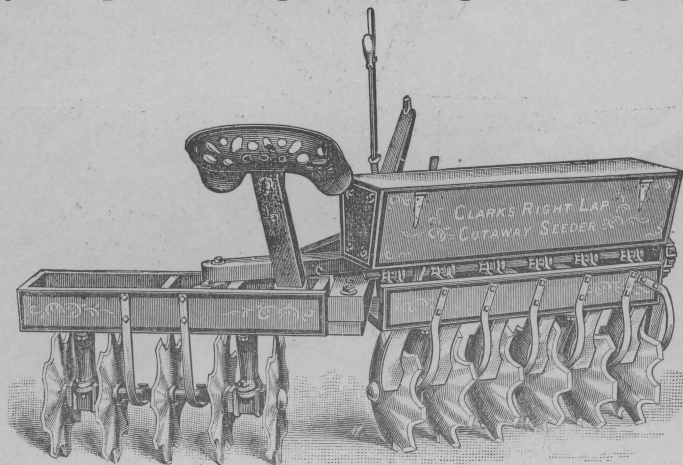
The Right Lap Cutaway.

The Right Lap Cutaway is made in three sizes, the 24-inch being reversible; the 36 and 48-inch are not reversible. All of the Right Laps will do more work than any plow in breaking up all stubble or old land, cutting all trash, weeds and stubble to a fine mulch and pulverizing the soil thoroughly to a depth of from four to six inches, and 36 and 48 inches wide respectively.

No dead furrows or center ridges, the ground being left in a most perfect condition for cultivating, each furrow lapping the other. Experience shows that the lap furrow aerates and puts the soil in better shape than the flat.

One very essential point in Right Laps we desire to call your attention to is the much greater scope of the disks and the greater working angle. The regular harrow disks work the soil about six inches wide, while the Right Lap much more thoroughly pulverizes to the width of about nine inches; practically the right hand gang does double work of the regular harrow gang. Always be particular to weight left hand gang as per directions.

Always Weight the Straight Disk Gang with a Bag of Sand.

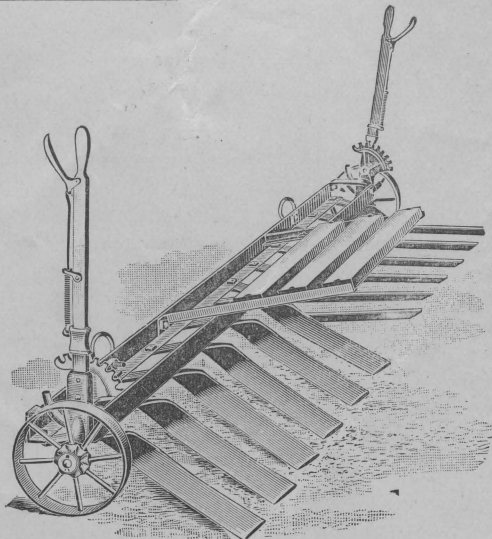


CLARK'S 36-inch Right Lap Cutaway with Force Feed Seeder.

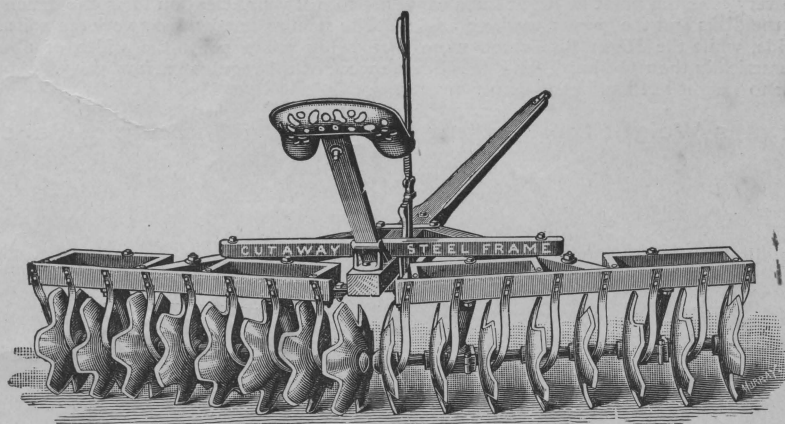
It is a positive force feed; no guess work. Be sure and send for best prices on these tools, as we propose to put them on the market at a price that will meet the demands of the smallest farmer.

The LIGHTNING WEEDER is something entirely new, as you will see by examining cut. It is made with a series of sharp knives which run under the ground from three to seven inches, cutting off and destroying all weeds of every name and nature, at the same time lightening up and aerating the soil. In fact, as a pulverizer, there is no tool that can equal it. For land resting from a previous crop by going over it a few times with this machine all such weeds as wild rose, French weed, milk weed, sun-flowers, etc., are killed and destroyed. It is perfectly balanced on two carrying wheels and by means of the lever can be adjusted to work in any position desired.

We also recommend this tool for the cultivation of orchards and vineyards as it can be run deep or shallow as desired. The Lightning weeder is made 6, 8 and 12 feet in width. You will make no mistake in trying one of these tools.



Cutaway Harrows are now made in Steel or Wood Frames.



A 8. 8-foot.

Cutaway Harrows are Made in the following sizes:

A-4	Cutaway Harrow,	One-Horse,	-	-	8, 16 inch Disks,	4 ft.	Cut.
A-4½	"	"	Light Two-Horse,	-	8, 16 "	5 ft.	"
A-5	"	"	Two-Horse,	-	10, 16 "	5 ft.	"
A-6	"	"	Two-Horse,	-	12, 16 "	6 ft.	"
A-7	"	"	Three-Horse,	-	14, 16 "	7 ft.	"
A-8	"	"	Four-Horse,	-	16, 16 "	8 ft.	"
A-10	"	"	Four to Six-Horse,	-	20, 16 "	10 ft.	"
A-12	"	"	Six-Horse,	-	24, 16 "	12 ft.	"
A-14	"	"	Six to Eight-Horse,	-	28, 16 "	14 ft.	"
A-16	"	"	Eight-Horse,	-	32, 16 "	16 ft.	"
X-6	"	"	Two-Horse,	-	12, 18 "	6 ft.	"
X-7	"	"	Three-Horse,	-	14, 18 "	7 ft.	"
X-8	"	"	Four-Horse,	-	16, 18 "	8 ft.	"
B-6	"	"	Two-Horse,	-	12, 20 "	6 ft.	"
B-7	"	"	Three-Horse,	-	14, 20 "	7 ft.	"
B-8	"	"	Four-Horse,	-	16, 20 "	8 ft.	"
B-10	"	"	Four to Six-Horse,	-	20, 20 "	10 ft.	"
B-12	"	"	Six-Horse,	-	24, 20 "	12 ft.	"
B-14	"	"	Eight-Horse,	-	28, 20 "	14 ft.	"